

- ☐ Tentative Specification
- ☐ Preliminary Specification
- ☒ Approval Specification

MODEL NO.: V400HJ1

SUFFIX: P01

|                                                                              |           |
|------------------------------------------------------------------------------|-----------|
| Customer:                                                                    |           |
| CONFIRMED BY                                                                 | SIGNATURE |
| <u>Name / Title</u>                                                          | <u></u>   |
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|                 |            |             |
|-----------------|------------|-------------|
| Approved By     | Checked By | Prepared By |
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## REVISION HISTORY

| Version  | Date          | Page(New) | Section | Description                                  |
|----------|---------------|-----------|---------|----------------------------------------------|
| Ver. 2.0 | Jun. 28, 2011 | All       | All     | The approval specification was first issued. |

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V400HJ1-P01 is a 40" TFT Liquid Crystal Display product with driver ICs and 2path mini-LVDS interface. This product supports 1920 x 1080 Full HDTV format and can display 16.7M colors (8-bit). The backlight unit is not built in.

### 1.2 FEATURES

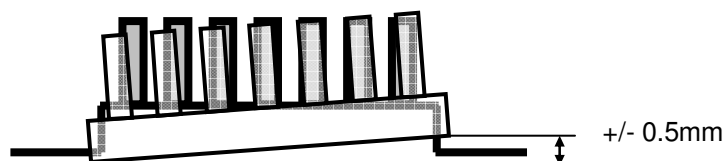
| CHARACTERISTICS ITEMS             | SPECIFICATIONS                                                                                                                        |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Screen Diagonal [in]              | 40                                                                                                                                    |
| Pixels [lines]                    | 1920 × 1080                                                                                                                           |
| Active Area [mm]                  | 885.6(H) × 498.15(V) (40" diagonal)                                                                                                   |
| Sub-Pixel Pitch [mm]              | 0.15375(H) × 0.46125(V)                                                                                                               |
| Pixel Arrangement                 | RGB Vertical Stripe                                                                                                                   |
| Weight [g]                        | Typ. 1800 g                                                                                                                           |
| Physical Size [mm]                | 904.7(W) × 539.05(H) × 8(D) Typ.                                                                                                      |
| Display Mode                      | Transmissive Mode / Normally Black                                                                                                    |
| Contrast Ratio                    | Typ.5000:1<br>(Typical value measure by CMI's Module)                                                                                 |
| Glass thickness (Array / CF) [mm] | 0.7 / 0.7                                                                                                                             |
| Viewing Angle (CR>20)             | +88/-88(H), +88/-88(V) Typ. (CR≥20)<br>(Typical value measure by CMI's module)                                                        |
| Color Chromaticity                | R = (0.650,0.325 )<br>G = (0.298,0.596 )<br>B = (0.144,0.077 )<br>W= (0.326,0.368 )<br>* Please refer to "color chromaticity" on p.15 |
| Cell Transparency [%]             | 4.8%                                                                                                                                  |
| Polarizer Surface Treatment       | Anti-Glare coating (Haze 11%)                                                                                                         |

### 1.3 MECHANICAL SPECIFICATIONS

| Item                            | Min.                                                                                                | Typ. | Max. | Unit | Note |
|---------------------------------|-----------------------------------------------------------------------------------------------------|------|------|------|------|
| Weight                          | -                                                                                                   | 1800 | -    | g    | -    |
| I/F connector mounting position | The mounting inclination of the connector makes the screen center within ± 0.5mm as the horizontal. |      |      |      | (2)  |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Connector mounting position



## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item                          | Symbol | Value |      | Unit | Note                        |
|-------------------------------|--------|-------|------|------|-----------------------------|
|                               |        | Min.  | Max. |      |                             |
| Storage Temperature           | TST    | -20   | +60  | °C   | (1)<br>With CMI Module      |
| Operating Ambient Temperature | TOP    | 0     | 50   | °C   | (1), (2)<br>With CMI Module |

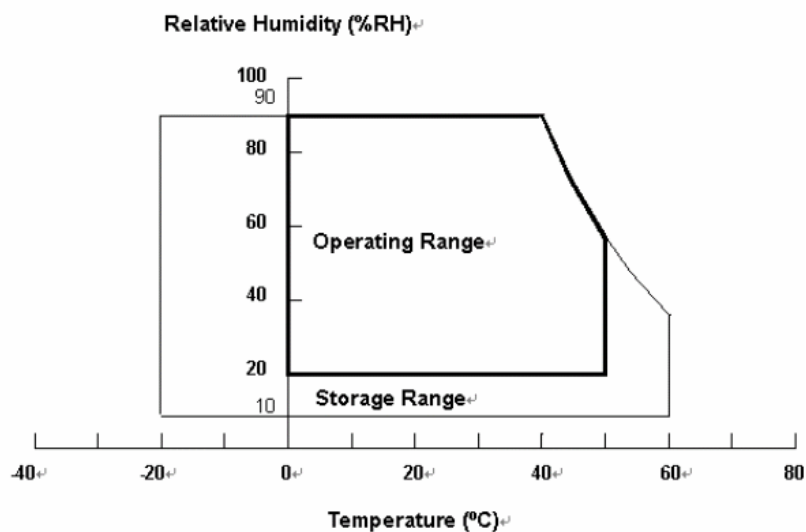
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ( $T_a \leq 40^\circ\text{C}$ ).

(b) Wet-bulb temperature should be  $39^\circ\text{C}$  Max. ( $T_a > 40^\circ\text{C}$ ).

(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to  $65^\circ\text{C}$  with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over  $65^\circ\text{C}$ . The range of operating temperature may degrade in case of improper thermal management in final product design.



## 2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Recommended Storage Condition: With shipping package.

Recommended Storage temperature range:  $25\pm 5\text{ }^{\circ}\text{C}$

Recommended Storage humidity range:  $50\pm 10\%\text{RH}$

Recommended Shelf life: a month

### 3. ELECTRICAL CHARACTERISTICS

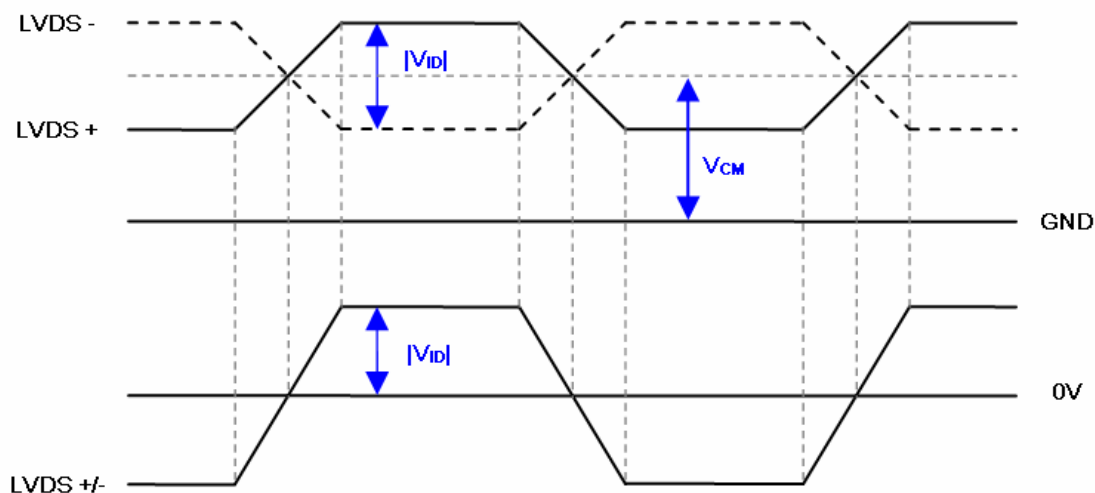
#### 3.1 TFT LCD OPEN CELL

(Ta = 25 ± 2 °C)

| Parameter            |                              | Symbol          | Value |      |      | Unit | Note |
|----------------------|------------------------------|-----------------|-------|------|------|------|------|
|                      |                              |                 | Min.  | Typ. | Max. |      |      |
| Power Supply Voltage |                              | VGH             | 24    | 25   | 26   | V    |      |
|                      |                              | VGL             | -8.3  | -8.0 | -7.7 | V    |      |
|                      |                              | VDA             | 17.4  | 17.7 | 18.0 | V    |      |
|                      |                              | VDD             | 3.2   | 3.3  | 3.4  | V    |      |
| Power Supply Current |                              | IGH             | -     | 10   | -    | mA   |      |
|                      |                              | IGL             | -     | 3    | -    | mA   |      |
|                      |                              | IDA             | -     | 350  | -    | mA   |      |
|                      |                              | IDD             | -     | 345  | -    | mA   |      |
| CMOS interface       | Input High Threshold Voltage | V <sub>IH</sub> | 2.7   | -    | 3.3  | V    |      |
|                      | Input Low Threshold Voltage  | V <sub>IL</sub> | 0     | -    | 0.7  | V    |      |

#### 3.2 Mini-LVDS CHARACTERISTICS

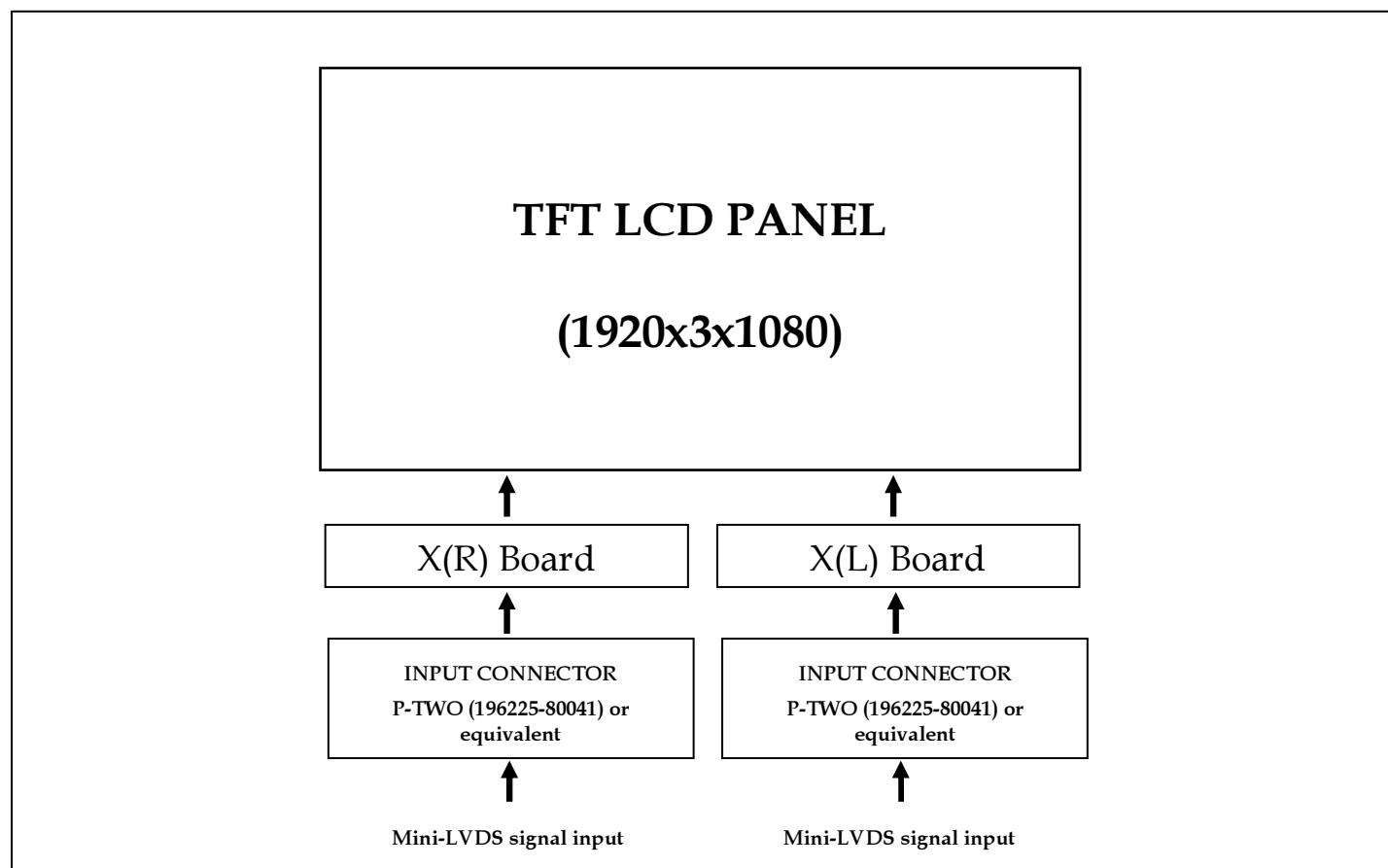
| Item                                                     | Symbol          | Condition                          | Value   |     |         | Unit |
|----------------------------------------------------------|-----------------|------------------------------------|---------|-----|---------|------|
|                                                          |                 |                                    | Min     | Typ | Max     |      |
| Mini-LVDS differential voltage (amplitude: peak to peak) | V <sub>ID</sub> | 3.0V ≤ VDD ≤ 3.6V<br>FCPV ≤ 330MHz | 200     | -   | 600     | mV   |
| Mini-LVDS common mode input voltage range (center)       | V <sub>CM</sub> | 3.0V ≤ VDD ≤ 3.6V                  | VSS+0.5 | 1.2 | VDD-1.2 | V    |





#### 4. INPUT TERMINAL PIN ASSIGNMENT

##### 4.1 TFT LCD OPEN CELL



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD OPEN CELL INPUT

#### CN1 (XL) Connector Pin Assignment

| Pin No. | Symbol | Description           | Pin No. | Symbol | Description                             |
|---------|--------|-----------------------|---------|--------|-----------------------------------------|
| 1       | GND    | Ground                | 41      | NC     | No connection                           |
| 2       | LV5N   | Mini-LVDS data signal | 42      | STV    | Scan driver start pulse                 |
| 3       | LV5P   | Mini-LVDS data signal | 43      | TP1    | Mini-LVDS data latch                    |
| 4       | LV4N   | Mini-LVDS data signal | 44      | EIOA   | Source driver start pulse A             |
| 5       | LV4P   | Mini-LVDS data signal | 45      | EIOB   | Source driver start pulse B             |
| 6       | LV3N   | Mini-LVDS data signal | 46      | VDASEL | Half/Full VDA operating range selection |
| 7       | LV3P   | Mini-LVDS data signal | 47      | GND    | Ground                                  |
| 8       | GND    | Ground                | 48      | GM18   | Gamma Power supply                      |
| 9       | LVCLKN | Data driver clock     | 49      | GM17   | Gamma Power supply                      |
| 10      | LVCLKP | Data driver clock     | 50      | GM16   | Gamma Power supply                      |
| 11      | GND    | Ground                | 51      | GM15   | Gamma Power supply                      |
| 12      | LV2N   | Mini-LVDS data signal | 52      | GM14   | Gamma Power supply                      |
| 13      | LV2P   | Mini-LVDS data signal | 53      | GM13   | Gamma Power supply                      |
| 14      | LV1N   | Mini-LVDS data signal | 54      | GM12   | Gamma Power supply                      |
| 15      | LV1P   | Mini-LVDS data signal | 55      | GM10   | Gamma Power supply                      |
| 16      | LV0N   | Mini-LVDS data signal | 56      | GM9    | Gamma Power supply                      |
| 17      | LV0P   | Mini-LVDS data signal | 57      | GM7    | Gamma Power supply                      |
| 18      | GND    | Ground                | 58      | GM6    | Gamma Power supply                      |
| 19      | LV5N   | Mini-LVDS data signal | 59      | GM5    | Gamma Power supply                      |
| 20      | LV5P   | Mini-LVDS data signal | 60      | GM4    | Gamma Power supply                      |
| 21      | LV4N   | Mini-LVDS data signal | 61      | GM3    | Gamma Power supply                      |
| 22      | LV4P   | Mini-LVDS data signal | 62      | GM2    | Gamma Power supply                      |
| 23      | LV3N   | Mini-LVDS data signal | 63      | GM1    | Gamma Power supply                      |
| 24      | LV3P   | Mini-LVDS data signal | 64      | GND    | Ground                                  |
| 25      | GND    | Ground                | 65      | VDAH   | Driver Power supply                     |

|    |        |                             |    |      |                     |
|----|--------|-----------------------------|----|------|---------------------|
| 26 | LVCLKN | Data driver clock           | 66 | VDAL | Driver Power supply |
| 27 | LVCLKP | Data driver clock           | 67 | GND  | Ground              |
| 28 | GND    | Ground                      | 68 | VCM  | VCM Power supply    |
| 29 | LV2N   | Mini-LVDS data signal       | 69 | VCM  | VCM Power supply    |
| 30 | LV2P   | Mini-LVDS data signal       | 70 | GND  | Ground              |
| 31 | LV1N   | Mini-LVDS data signal       | 71 | VDA  | Driver Power supply |
| 32 | LV1P   | Mini-LVDS data signal       | 72 | VDA  | Driver Power supply |
| 33 | LV0N   | Mini-LVDS data signal       | 73 | GND  | Ground              |
| 34 | LV0P   | Mini-LVDS data signal       | 74 | VDD  | Logic Power supply  |
| 35 | GND    | Ground                      | 75 | VDD  | Logic Power supply  |
| 36 | GND    | Ground                      | 76 | VGL  | Driver Power supply |
| 37 | OE1    | Scan driver output enable 1 | 77 | VGL  | Driver Power supply |
| 38 | OE2    | Scan driver output enable 2 | 78 | VGH  | Driver Power supply |
| 39 | CKV    | Scan driver clock           | 79 | VGH  | Driver Power supply |
| 40 | POL    | polarity invert             | 80 | GND  | Ground              |

**CN1 (XR) Connector Pin Assignment**

| Pin No. | Symbol | Description         | Pin No. | Symbol | Description           |
|---------|--------|---------------------|---------|--------|-----------------------|
| 1       | GND    | Ground              | 41      | RV2P   | Mini-LVDS data signal |
| 2       | VGH    | Driver Power supply | 42      | RV1N   | Mini-LVDS data signal |
| 3       | VGH    | Driver Power supply | 43      | RV1P   | Mini-LVDS data signal |
| 4       | VGL    | Driver Power supply | 44      | RV0N   | Mini-LVDS data signal |
| 5       | VGL    | Driver Power supply | 45      | RV0P   | Mini-LVDS data signal |
| 6       | VDD    | Logic Power supply  | 46      | GND    | Ground                |
| 7       | VDD    | Logic Power supply  | 47      | RV5N   | Mini-LVDS data signal |
| 8       | GND    | Ground              | 48      | RV5P   | Mini-LVDS data signal |
| 9       | VDA    | Driver Power supply | 49      | RV4N   | Mini-LVDS data signal |
| 10      | VDA    | Driver Power supply | 50      | RV4P   | Mini-LVDS data signal |

|    |        |                                         |    |        |                       |
|----|--------|-----------------------------------------|----|--------|-----------------------|
| 11 | GND    | Ground                                  | 51 | RV3N   | Mini-LVDS data signal |
| 12 | VCM    | VCM Power supply                        | 52 | RV3P   | Mini-LVDS data signal |
| 13 | VCM    | VCM Power supply                        | 53 | GND    | Ground                |
| 14 | GND    | Ground                                  | 54 | RVCLKN | Data driver clock     |
| 15 | VDAL   | Driver Power supply                     | 55 | RVCLKP | Data driver clock     |
| 16 | VDAH   | Driver Power supply                     | 56 | GND    | Ground                |
| 17 | GND    | Ground                                  | 57 | RV2N   | Mini-LVDS data signal |
| 18 | NC     | No connection                           | 58 | RV2P   | Mini-LVDS data signal |
| 19 | VDASEL | Half/Full VDA operating range selection | 59 | RV1N   | Mini-LVDS data signal |
| 20 | EIOB   | Source driver start pulse B             | 60 | RV1P   | Mini-LVDS data signal |
| 21 | EIOA   | Source driver start pulse A             | 61 | RV0N   | Mini-LVDS data signal |
| 22 | TP1    | Mini-LVDS data latch                    | 62 | RV0P   | Mini-LVDS data signal |
| 23 | STV    | Scan driver start pulse                 | 63 | GND    | Ground                |
| 24 | NC     | No connection                           | 64 | GM18   | Gamma Power supply    |
| 25 | POL    | polarity invert                         | 65 | GM17   | Gamma Power supply    |
| 26 | CKV    | Scan driver clock                       | 66 | GM16   | Gamma Power supply    |
| 27 | OE2    | Scan driver output enable 2             | 67 | GM15   | Gamma Power supply    |
| 28 | OE1    | Scan driver output enable 1             | 68 | GM14   | Gamma Power supply    |
| 29 | GND    | Ground                                  | 69 | GM13   | Gamma Power supply    |
| 30 | RV5N   | Mini-LVDS data signal                   | 70 | GM12   | Gamma Power supply    |
| 31 | RV5P   | Mini-LVDS data signal                   | 71 | GM10   | Gamma Power supply    |
| 32 | RV4N   | Mini-LVDS data signal                   | 72 | GM9    | Gamma Power supply    |
| 33 | RV4P   | Mini-LVDS data signal                   | 73 | GM7    | Gamma Power supply    |
| 34 | RV3N   | Mini-LVDS data signal                   | 74 | GM6    | Gamma Power supply    |
| 35 | RV3P   | Mini-LVDS data signal                   | 75 | GM5    | Gamma Power supply    |
| 36 | GND    | Ground                                  | 76 | GM4    | Gamma Power supply    |
| 37 | RVCLKN | Data driver clock                       | 77 | GM3    | Gamma Power supply    |
| 38 | RVCLKP | Data driver clock                       | 78 | GM2    | Gamma Power supply    |

|    |      |                       |    |     |                    |
|----|------|-----------------------|----|-----|--------------------|
| 39 | GND  | Ground                | 79 | GM1 | Gamma Power supply |
| 40 | RV2N | Mini-LVDS data signal | 80 | GND | Ground             |

Note (1) The EIOA must be connected to the EIOB.  
 Note (2) The VDAH must be connected to the GND.  
 Note (3) The VDAL must be connected to the VDA.  
 Note (2) Please set VDASEL to low.

## 5.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

| Color               |                  | Data Signal |    |    |    |    |    |    |    |       |    |    |    |    |    |    |    |      |    |    |    |    |    |   |   |  |  |
|---------------------|------------------|-------------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|--|--|
|                     |                  | Red         |    |    |    |    |    |    |    | Green |    |    |    |    |    |    |    | Blue |    |    |    |    |    |   |   |  |  |
|                     |                  |             |    |    |    |    |    |    |    |       |    |    |    |    |    |    |    |      |    |    |    |    |    |   |   |  |  |
| R7                  | R6               | R5          | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5    | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5   | B4 | B3 | B2 | B1 | B0 |   |   |  |  |
| Basic Colors        | Black            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0 |  |  |
|                     | Red              | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 | 0 |  |  |
|                     | Green            | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Blue             | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1 |   |  |  |
|                     | Cyan             | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1 |   |  |  |
|                     | Magenta          | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1 |   |  |  |
|                     | Yellow           | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | White            | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1  | 1 |   |  |  |
| Gray Scale Of Red   | Red (0) / Dark   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Red (1)          | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Red (2)          | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | : |   |  |  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | : |   |  |  |
|                     | Red (253)        | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Red (254)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Red (255)        | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
| Gray Scale Of Green | Green (0) / Dark | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Green (1)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Green (2)        | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | : |   |  |  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | : |   |  |  |
|                     | Green (253)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Green (254)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Green (255)      | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
| Gray Scale Of Blue  | Blue (0) / Dark  | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 0 |   |  |  |
|                     | Blue (1)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 0  | 1 |   |  |  |
|                     | Blue (2)         | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0    | 0  | 0  | 0  | 0  | 1  | 0 |   |  |  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | : |   |  |  |
|                     | :                | :           | :  | :  | :  | :  | :  | :  | :  | :     | :  | :  | :  | :  | :  | :  | :  | :    | :  | :  | :  | :  | :  | : |   |  |  |
|                     | Blue (253)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 0 |   |  |  |
|                     | Blue (254)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 0 |   |  |  |
|                     | Blue (255)       | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0     | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1  | 1 |   |  |  |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

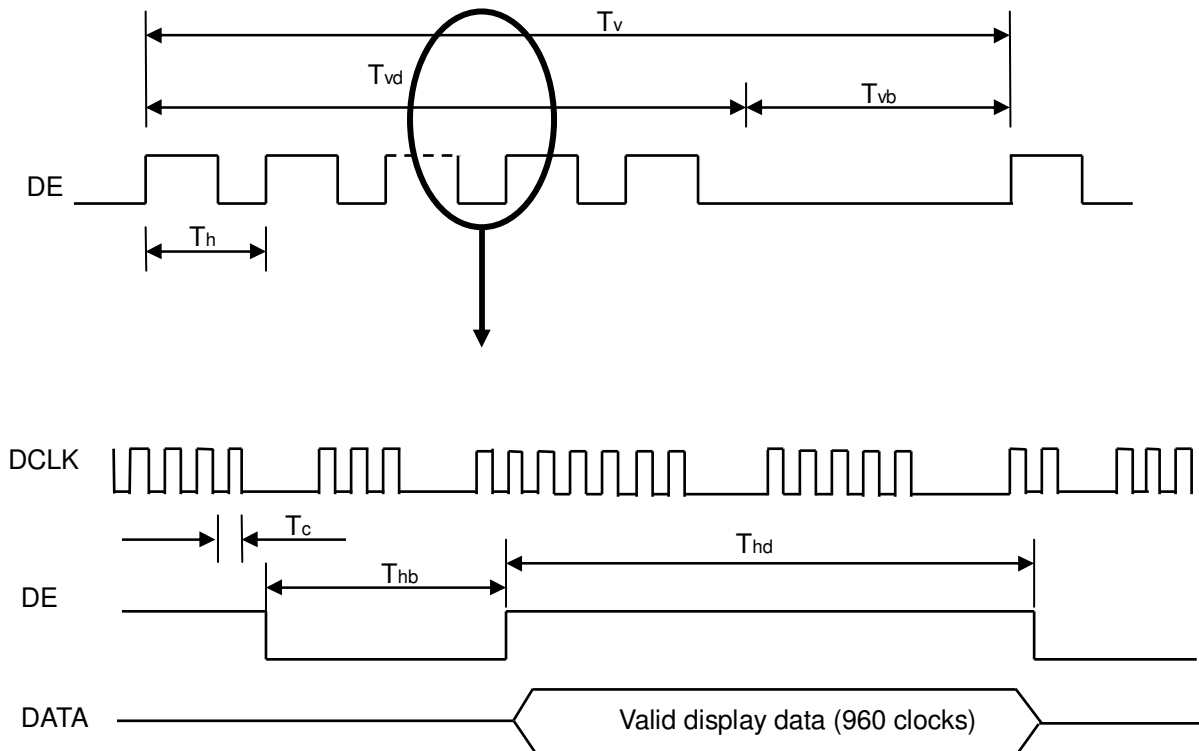
## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

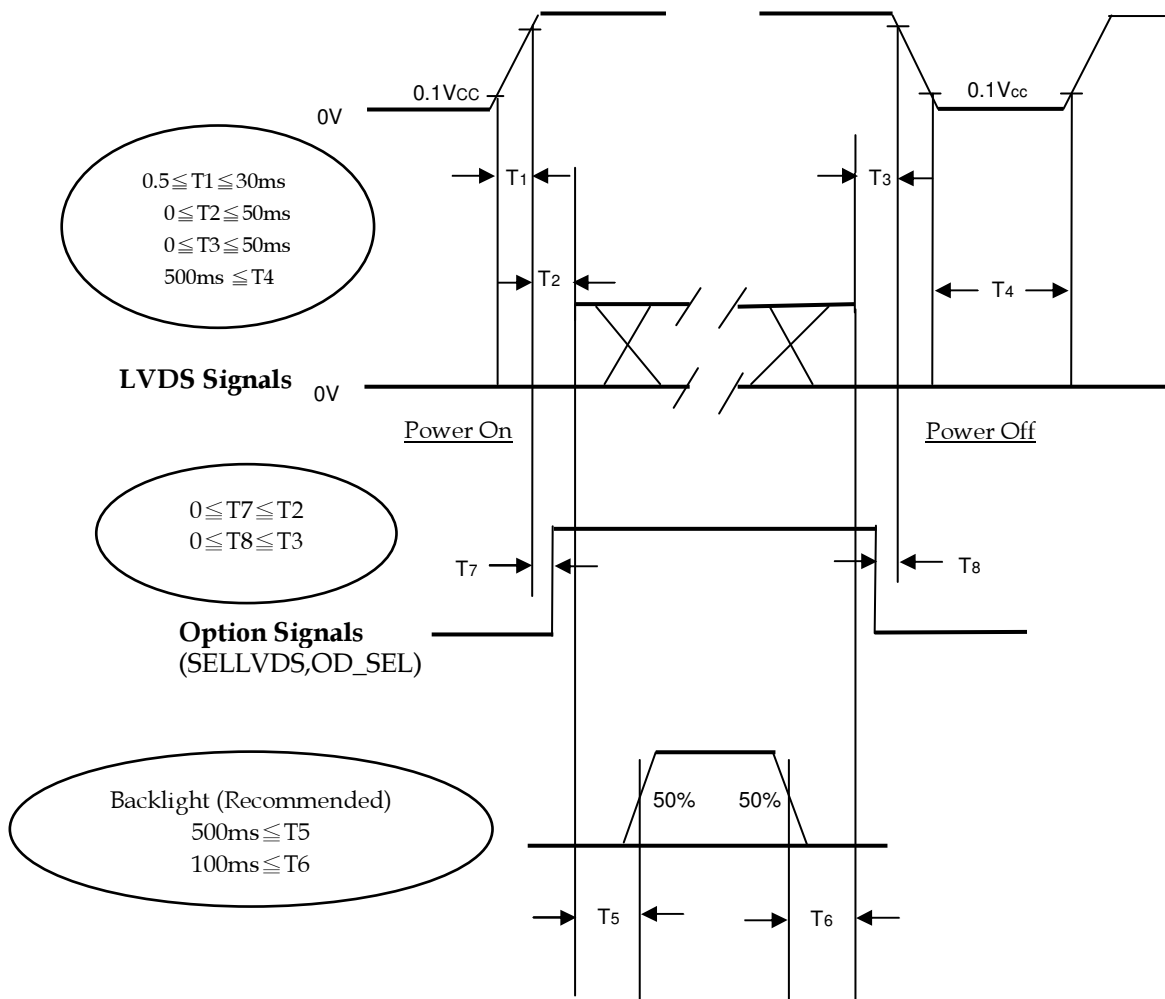
| Signal                         | Item       | Symbol | Min. | Typ. | Max. | Unit | Note                    |
|--------------------------------|------------|--------|------|------|------|------|-------------------------|
| Vertical Active Display Term   | Frame Rate | Fr6    | 57   | 60   | 63   | Hz   |                         |
|                                |            | Fr5    | 47   | 50   | 53   |      |                         |
|                                | Total      | Tv     | 1115 | 1125 | 1135 | Th   | $T_v = T_{vd} + T_{vb}$ |
|                                | Display    | Tvd    | 1080 | 1080 | 1080 | Th   | -                       |
|                                | Blank      | Tvb    | 35   | 45   | 55   | Th   | -                       |
| Horizontal Active Display Term | Total      | Th     | 1050 | 1100 | 1150 | Tc   | $T_h = T_{hd} + T_{hb}$ |
|                                | Display    | Thd    | 960  | 960  | 960  | Tc   | -                       |
|                                | Blank      | Thb    | 90   | 140  | 190  | Tc   | -                       |

#### INPUT SIGNAL TIMING DIAGRAM



## 6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



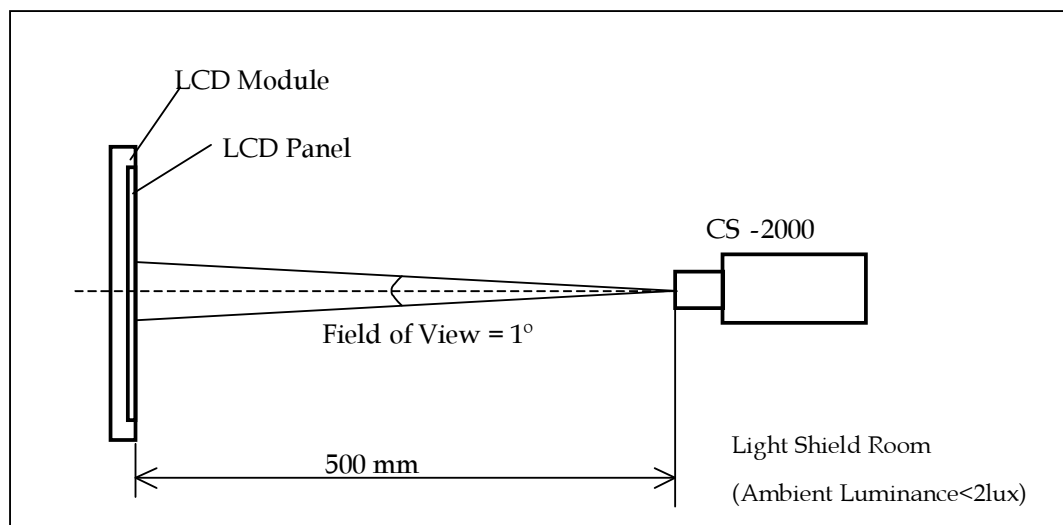


## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

| Item                | Symbol | Value | Unit |
|---------------------|--------|-------|------|
| Ambient Temperature | Ta     | 25±2  | °C   |
| Ambient Humidity    | Ha     | 50±10 | %RH  |
| Vertical Frame Rate | Fr     | 60    | Hz   |

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.



## 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 5.1 and stable environment shown in 5.1.

| Item                 |            | Symbol        | Condition                                                                                                                                  | Min.  | Typ.  | Max.  | Unit | Note    |
|----------------------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|------|---------|
| Color Chromaticity   | Red        | Rcx           | $\theta_x=0^\circ, \theta_Y=0^\circ$<br>Viewing Angle at Normal Direction<br>Standard light source “C”<br><br>With CMI Module & Tcon Board | -0.03 | 0.650 | +0.03 | -    | (0)     |
|                      |            | Rcy           |                                                                                                                                            |       | 0.325 |       | -    |         |
|                      | Green      | Gcx           |                                                                                                                                            |       | 0.298 |       | -    |         |
|                      |            | Gcy           |                                                                                                                                            |       | 0.596 |       | -    |         |
|                      | Blue       | Bcx           |                                                                                                                                            |       | 0.144 |       | -    |         |
|                      |            | Bcy           |                                                                                                                                            |       | 0.077 |       | -    |         |
|                      | White      | Wcx           |                                                                                                                                            |       | 0.326 |       | -    |         |
|                      |            | Wcy           |                                                                                                                                            |       | 0.368 |       | -    |         |
| Center Transmittance |            | T%            | $\theta_x=0^\circ, \theta_Y=0^\circ$<br><br>With CMI Module & Tcon Board                                                                   | -     | 4.8   | -     | %    | (1),(5) |
| Contrast Ratio       |            | CR            |                                                                                                                                            | 3500  | 5000  | -     | -    | (1),(3) |
| Response Time        |            | Gray to gray  |                                                                                                                                            | -     | 7.5   | 14    | ms   | (1),(4) |
| Viewing Angle        | Horizontal | $\theta_{x+}$ | $CR\geq 20$<br><br>With CMI Module & Tcon Board                                                                                            | -     | 88    | -     | Deg. | (1),(2) |
|                      |            | $\theta_{x-}$ |                                                                                                                                            | -     | 88    | -     |      |         |
|                      | Vertical   | $\theta_{Y+}$ |                                                                                                                                            | -     | 88    | -     |      |         |
|                      |            | $\theta_{Y-}$ |                                                                                                                                            | -     | 88    | -     |      |         |

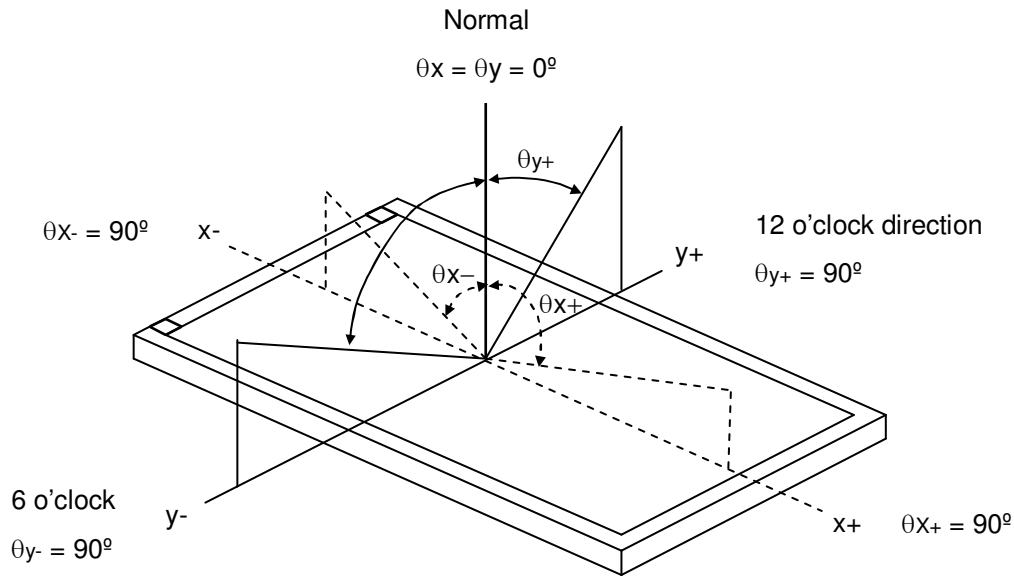
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following :

- 1.Measure Module's W,R,G,B spectrum and BLU's spectrum. Which BLU is supplied by **V400H1-L10**.
- 2.Calculate cell's spectrum.
- 3.Calculate cell's chromaticity by using the spectrum of standard light source "C".

Note (1) Light source is the BLU which supplied by CMI and driving voltage are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle ( $\theta_x, \theta_y$ ) :

Viewing angles are measured by Autronic Conoscope Cono-80



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

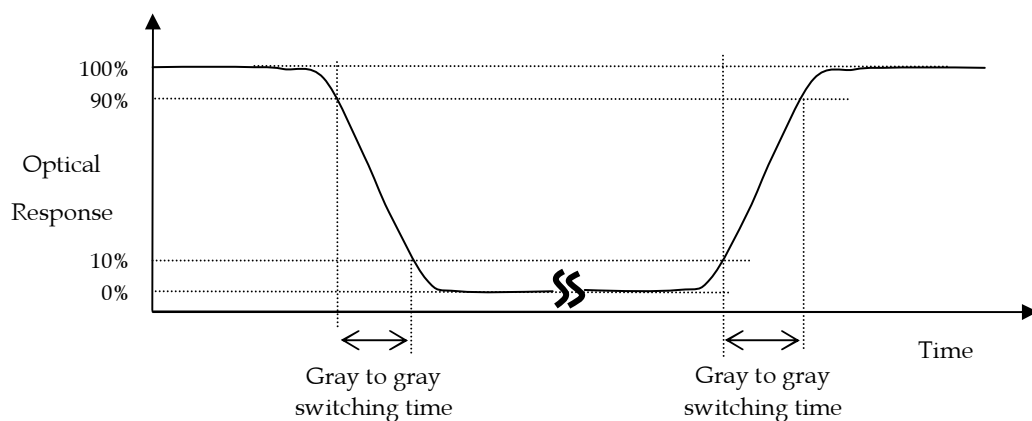
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (4) Definition of Response Time ( $T_R$ ,  $T_F$ , Gray to Gray) :



The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255

$T_R$  means switching time from gray 0 to 255

$T_F$  means switching time from gray 255 to 0

Gray to gray means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255 to each other.

Note (5) Definition of Transmittance (T%) :

Measure the luminance of gray level 255 at center point of LCD module.

$$\text{Transmittance (T\%)} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backligh unit}} \times 100\%$$

## 8. PRECAUTIONS

### 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

- [ 1 ] Do not apply rough force such as bending or twisting to the module during assembly.
- [ 2 ] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- [ 3 ] Do not apply pressure or impulse to the module to prevent the damage of LCD panel.
- [ 4 ] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.
- [ 5 ] The distance between COF edge and rib of BLU is suggested to be larger than 5mm, in order to prevent from damage on COF during module assembly.
- [ 6 ] Do not design sharp-pointed structure / parting line / tooling gate on the COF position of plastic parts, because the burr will scrape the COF.
- [ 7 ] If COF would be bended during module assembly, it is suggested not to locate the IC on the bending corner of COF.
- [ 8 ] The gap between COF IC and any structure of BLU is suggested to be larger than 2mm, in order to prevent from damage on COF IC.
- [ 9 ] Bezel opening must have no burr. Burr will scrape the panel surface.
- [ 10 ] It is suggested that bezel of module and bezel of TV set can not press or touch the panel surface. It will make light leakage or scrape.
- [ 11 ] When module used FFC / FPC, but no FFC / FPC to be attached in the open cell. Customer can refer the FFC / FPC drawing and buy it by self.
- [ 12 ] The gap between Panel and any structure of Bezel is suggested to be larger than 2mm, in order to prevent from damage on Panel.
- [ 13 ] Do not plug in or pull out the I/F connector while the module is in operation.
- [ 14 ] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- [ 15 ] Moisture can easily penetrate into LCD module and may cause the damage during operation.
- [ 16 ] When storing modules as spares for a long time, the following precaution is necessary.
  - [ 16.1 ] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C at normal humidity without condensation.
  - [ 16.2 ] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.
- [ 17 ] When ambient temperature is lower than 10°C, the display quality might be reduced.
- [ 18 ] The peeling strength of COF is 200gf/cm.
- [ 19 ] During module assembly process, the static electricity around the environment should be less than 300V.

## 8.2 SAFETY PRECAUTIONS

- [ 1 ] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- [ 2 ] After end of life of the open cell product, it is not harmful in case of normal operation and storage.

## 9. DEFINITION OF LABELS

### 9.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMI internal control.

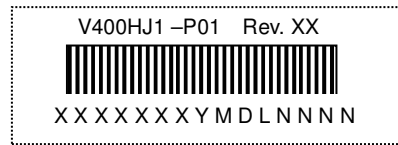
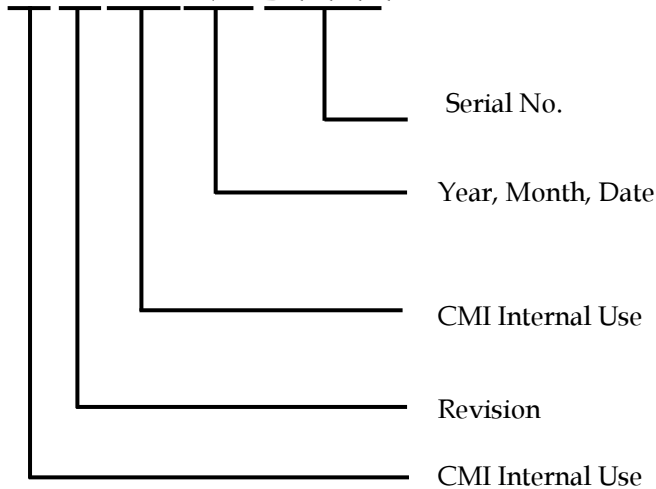


Figure.9-1 Serial No. Label on SPWB and Cell

Model Name: V400HJ1-P01

Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.

Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

Manufactured Date:

Year: 2010=0, 2011=1, 2012=2...etc.

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O, and U.

Revision Code: Cover all the change

Serial No.: Manufacturing sequence of product

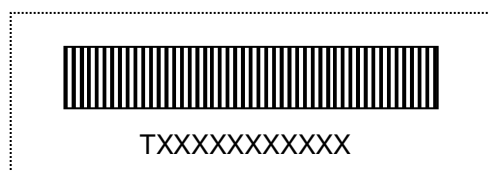
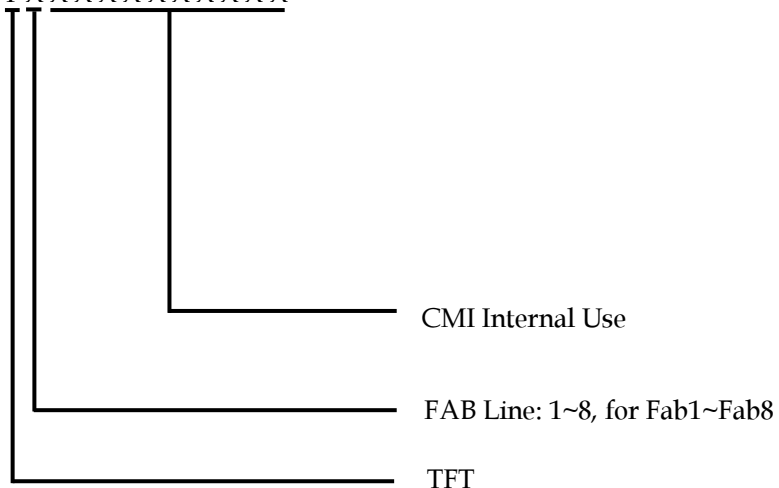


Figure.9-2 Panel ID Label on Cell

Panel ID Label includes the information as below :

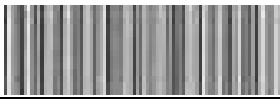
Panel ID: T X X X X X X X X X





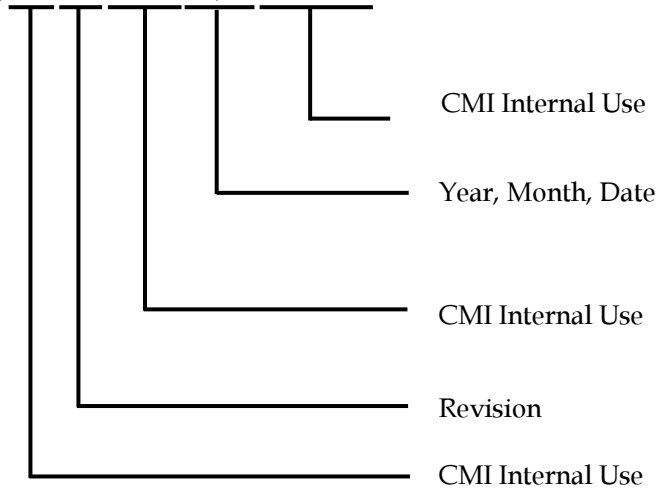
## 9.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation.

|                                |                                                                                                       |
|--------------------------------|-------------------------------------------------------------------------------------------------------|
| RoHS                           |                                                                                                       |
| P.O. NO.                       | _____                                                                                                 |
| Parts ID.                      | _____                                                                                                 |
| Model Name                     | V400HJ1-P01                                                                                           |
| Carton ID.                     | <br>XXXXXXXXXXXXXXXX |
| Quantities                     | ____                                                                                                  |
| Made In Taiwan (Made In China) |                                                                                                       |

(a) Model Name: V400HJ1- P01

(b) Carton ID: X X X X X X Y M D X X X X



Serial ID includes the information as below :

Manufactured Date:

Year: 2010=0, 2011=1, 2012=2...etc.

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O, and U.

Revision Code: Cover all the change

(c) Quantities: 12

## 10. PACKAGING

### 10.1 PACKAGING SPECIFICATIONS

- (1) 12 PCS LCD TV Panels / 1 Box
- (2) Box dimensions :1008(L) X 738(W) X 252(H)mm
- (3) Weight : approximately 38 Kg
- (4) Desiccant (Drier) : Weight 30g / 1 piece, Quantity 4 pcs, Cobalt chloride free.

### 10.2 PACKAGING METHOD

Packing method is shown in Figure 10.1 & 10.2

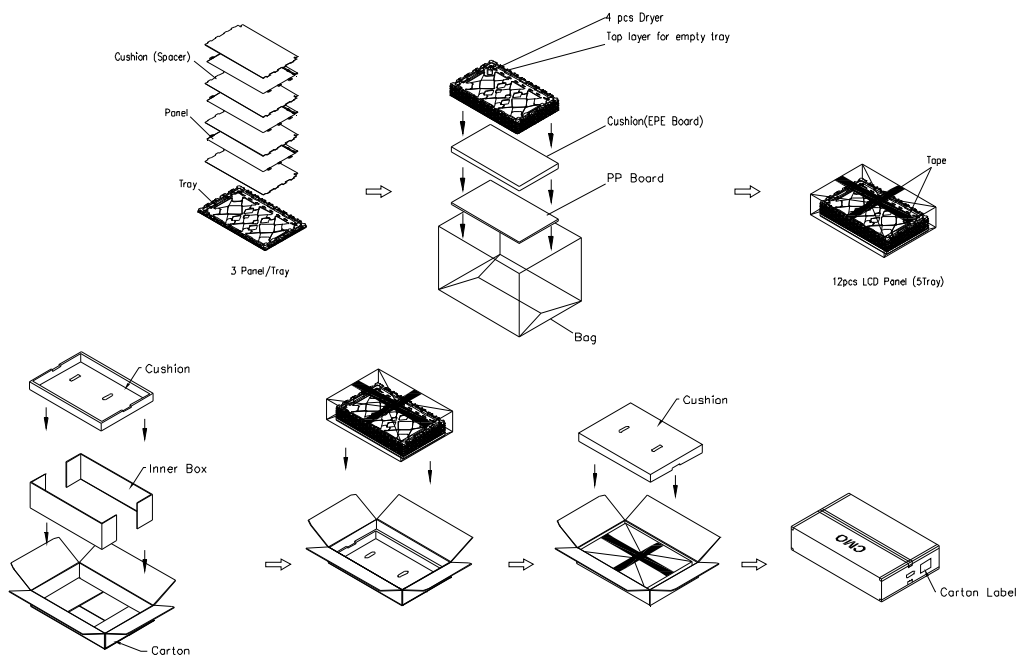
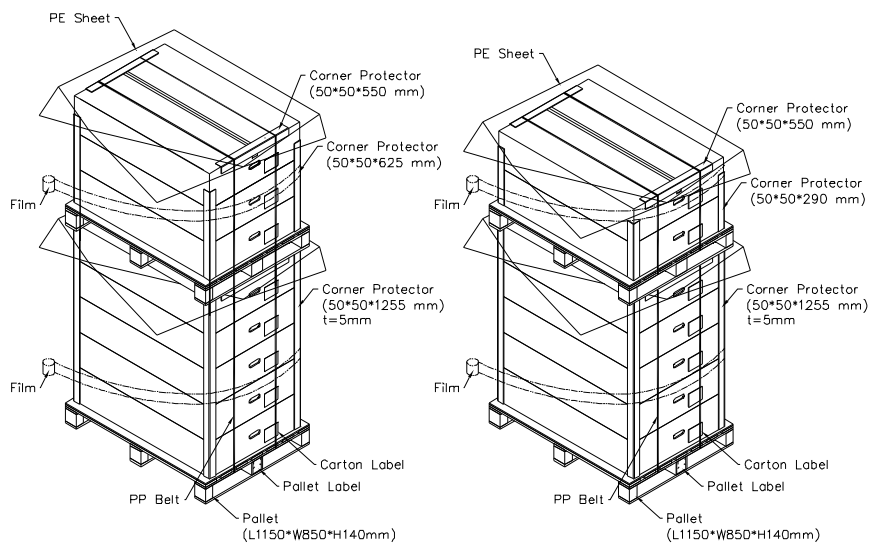


Figure.10-1 Packing Method

Sea / Land Transportation  
(40ft HQ Container)

Sea / Land Transportation



Air Transportation

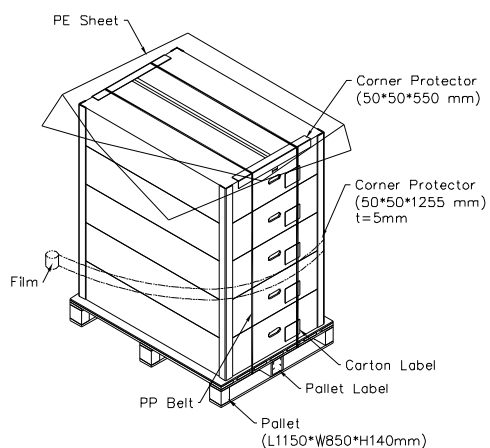


Figure.10-2 Packing Method

## 11. MECHANICAL CHARACTERISTIC

